भारतीय मानक
Indian Standard

IS 14667 : 2018

चीनी उद्योग में उपयोग की जाने वाली वाहक कड़ियां और पट्टियां — विशिष्टि

(पहला पुनरीक्षण)

Conveyor Chains and Slats Used in Sugar Industry — Specification

(First Revision)

ICS 65.060

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भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
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November 2018 **Price Group 8**

Sugar Industry Sectional Committee, FAD 02

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Sugar Industry Sectional Committee had been approved by the Food and Agriculture Division Council.

The chains and slats are important components used in sugar industry to carry material at various stages. This Indian Standard, is an amalgamated form of IS 8465 : 1990, IS 8466 : 1990, IS 9054 : 1983, IS 9069 : 1979 and a document on feeder table chain, describes the requirements at one place. In this revision of standard, various requirements have been added in light of present practice in the sugar industries. The dimensions of various chains along with the breaking and proof loads added into various tables given in the standard. Dimensions of apron type inter-carrier slats for different plant capacities/sizes added in the Table 7 of the standard.

The composition of the Committee responsible for the formulation of this standard is given at Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CONVEYOR CHAINS AND SLATS USED IN SUGAR INDUSTRY — SPECIFICATION

(First Revision)

1 SCOPE

This standard specifies materials, dimensions and other requirements for various chains and slats used in sugar industry.

2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
IS 549 : 1974	Split pins (*second revision*)
IS 1570 (Part 4) : 1988	Alloy steels (alloy constructional and spring steels) with specified mechanical composition and mechanical properties (*first revision*)
IS 1875 : 1978	Specification for carbon steel billets, blooms, slabs and bars for forgings (*fourth revision*)
IS 2108 : 1977	Blackheart malleable iron casting (*first revision*)
IS 4367 : 1991	Alloy steel forgings for general industrial use (*first revision*)
IS 2062 : 1992	Steel for general structural purposes (*fourth revision*)
IS 2500 (Part 1) : 1992	Sampling inspection procedures: Part 1 Attribute sampling plans indexed by acceptable quality level (AQL) for lot by lot inspection (*second revision*)
IS 5517 : 1993	Steel for hardening and tempering (*second revision*)

3 MATERIAL

3.1 The material for side links, pin bush and roller for cane carrier, bagasse carrier and feeder table chains shall be as given below.

3.1.1 *Side Links*

Steel conforming to grade 55 C8 of IS 1875 shall be used.

3.1.2 *Pin and Bush*

Steel conforming to grade 16Ni3Cr2 of IS 1570 (Part 4) shall be used.

3.1.3 *Roller*

Mild steel conforming to grade Fe 410-s of IS 2062 shall be used.

3.2 Material for side links, pin, bush and roller for apron type inter carrier chain shall be as given below.

3.2.1 *Links*

Blackheart malleable cast iron of IS 2108 and forged steel of IS 4367.

3.2.2 *Pin*

Steel conforming to grade 55 C8 of IS 1875 and grade 40 C8 of IS 5517.

3.2.3 *Bush*

Steel conforming to grade 40 C8 of Is 5517.

4 DIMENSION

4.1 Chains

4.1.1 The dimensions of various chains along with the breaking and proof loads shall be as given in Tables 1 to 5.

Table 1 Dimensions and Requirements for Apron Type Inter-Carrier Chains

(*Clause* 4.1.1)

All Dimensions in millimetres

Sl. No.	**Pitch**	**Pin Diametre**	**Bush Inner Diametre**	**Loads, *Min***		**Thickness of Corresponding Slat**	**Width of Corresponding Slat**
(1)	**(2) mm**	**(3) mm**	**(4) mm**	**Breaking (5) kN**	**Proof (6) kN**	**(7) mm**	**(8) mm**
i)	80.0	16 + 0	16.1 + 0.05	117	39	+ 1.0	110 – 115 + 1.0
	(one hole)	– 0.05	– 0			5 – 0.0	
ii)	75.4	16 + 0	16.1 + 0.05	117	39	+ 1.0	110 – 115 + 1.0
		– 0.05	– 0			5 – 0.0	

The hole shall be of 16 mm diametre. Split pins shall be of 32 m/m length and 4 mm diametre (*see* IS 549)

NOTE — The chain manufacturer, sugar machinery manufacturer or actual users shall adopt higher size of side links (higher dimension ‘K’) to provide extra margin in breaking load over stated in standard.

Table 2 Dimensions and Requirements for Cane-Carrier Chains

(*Clause* 4.1.1 and Fig. 3)

All Dimensions in millimetres.

Pitch	**Thickness**	**Pin**			**Bush**		**Roller**		**Split Pin**		**Side Links**				**Bolts**			**Loads in kN, *Min***		**Thickness of Slat**	**Width of the Slats**
		Diametre	*Length*	*Diametre of Head*	*Diametre*	*Length*	*Diametre*	*Length*	*Diametre*	*Length*					*Cross section*		*Hole Diametre*	*Breaking*	*Proof*		
A	*B*	*C*	*D*	*J*	*K*	*F*	*G*	*H*			*K*	*L*	*M*	*N*	*S*	*T*	*V*				
150	8	20	78	25	27	48	60	30	6.3	45	50	36.0	25.0	5	120	60	12	200	67	5	188-183
150	10	23	92	28	30	56	75	35	6.3	45	60	45.0	30.0	5	150	75	14	300	100	5	188-183
150	12	25	101	32	33	61	75	35	6.3	45	65	47.5	32.5	3	150	75	14	400	135	6	188-183
150	12	25	101	32	33	61	75	35	6.3	45	65	47.5	32.5	3	150	75	14	400	135	6	188-183
150	12	28	101	34	35	61	75	35	6.3	45	65	47.5	32.5	3	130	60	14	500	167	6	188-183
150	12	28	101	34	35	61	75	35	8.0	50	65	47.5	32.5	3	150	75	14	500	167	6	188-183
150	14	28	110	34	36	65	75	35	8.0	50	65	47.5	32.5	3	150	75	14	600	200	6	188-183
150	16	30	118	36	38	69	90	35	10.0	50	75	52.5	37.5	3	150	75	14	800	267	8	188-183
200	14	28	101	34	36	61	90	35	10.0	50	75	56.0	37.5	3	150	75	14	600	200	6	200-195
200	16	30	110	36	38	65	90	35	10.0	50	75	56.0	37.5	3	170	80	14	750	250	8	230-225
200	16	32	120	38	40	69	90	35	10.0	50	75	56.0	37.5	3	170	80	18	800	267	8	230-225
200	16	32	120	38	40	60	90	35	10.0	50	75	56.0	37.5	3	170	100	18	1000	334	8	230-225

Table 3 Dimensions and Requirements for Bagasse Carrier Chains

(*Clause* 4.1.1 and Fig. 4)

All Dimensions in millimetres.

Pitch	**Thickness**	**Pin**			**Bush**		**Roller**		**Split Pin**		**Attachment Link**					**Loads in kN,**	
		Diametre	*Length*	*Diametre of Head*	*Diametre*	*Length*	*Diametre*	*Length*	*Diametre*	*Length*							
A	*B*	*C*	*D*	*J*	*K*	*F*	*G*	*H*			*K*	*L*	*M*	*N*	*W*	*Breaking*	*Proof*
150	8	20	78	28	27	48	60	30	6.3	45	50	16	70	10	50	200	67
150	10	23	91	28	30	57	75	35	6.3	45	65	16	75	12	50	300	100
150	10	28	101	28	33	61	75	35	6.3	45	60	16	85	12	65	400	135
150	12	28	101	32	35	61	75	35	6.3	45	65	19	85	16	65	500	175
150	14	28	110	32	36	65	75	35	6.3	45	65	19	95	25	65	600	200
150	16	30	118	36	38	69	90	35	8.3	50	75	22	100	25	65	800	200
200	12	28	101	32	36	61	90	35	6.3	45	75	19	85	20	65	600	200
200	14	30	110	36	38	65	90	35	8.3	50	75	22	95	25	80	750	250
200	16	32	120	38	40	69	90	35	8.3	50	75	22	100	25	80	800	267
200	16	32	120	38	40	69	90	35	10	60	75	22	100	25	80	100	334

NOTE — 1kN/mm^2 = 102kgf/mm^2

Table 4 Dimensions and Requirements for Feeder Table Chains

(*Clause* 4.1.1 and Fig. 5)

All Dimensions in millimetres

Pitch	**Side Links**		**Pin**			**Bush**		**Roller**		**Split Pin**		**Attachment Link**				**Loads in kN, *Min***	
			Diametre	*Length*	*Diametre of Head*	*Diametre*	*Length*	*Diametre*	*Length*	*Diametre*	*Length*					**Breaking**	**Proof**
A	*B*	*K*	*C*	*D*	*J*	*E*	*F*	*G*	*H*			*L*	*M*	*R1*	*R2*		
150	8	60	23	82	28	30	52	75	35	5.0	45	125	40	62	46	200	67
150	10	60	23	92	28	30	56	75	35	5.0	45	131	40	62	46	300	100
150	12	65	25	101	32	33	61	75	35	5.0	45	145	40	60	44	400	135

NOTE — 1kN/mm^2 = 102kgf/mm^2

Table 5 Dimensions and Requirements for Rake Elevator and Inter Carrier Chains

(*Clause* 4.1.1 and Fig. 10)

All Dimensions in millimetres

Pitch	Pin		Bush		Link						Rake at Plate			Loads in kN,	
	Diametre	*Nut Size*	*Diametre*	*Length*										*Breaking Load*	*Proof Load*
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*		
102	16	M -12	22	20	15	8.5	38	26	20	10	60	90	17	1 000	340
102	18	M -16	23	24	20	14	55	28	20	10	60	90	17	1 500	500
150	28	M -24	34	32	20	14	61	50	30	16	60	100	18	4 500	1 500
200	26	M -30	32	28	19	13	55	46	32	12	60	80	18	4 000	1 350
229	32	M -30	40	33	28	18	71	57	35	16	70	110	18	6 000	2 000
229	32	M -30	40	34	28	20	76	65	40	16	70	120	18	7 000	2 350
229	34	M -30	42	40	30	22	86	68	40	16	50	145	20	8 000	2 670
229	45	M -30	44	40	32	24	90	65	43	20	70	150	20	10 000	3 350
300	36	M -30	44	40	32	22	86	65	43	25	100	108	18	8 000	2 670
300	36	M -30	44	44	32	25	95	62	45	20	112	120	22	9 000	3 000
300	45	M -39	57	50	35	30	112	64	50	20	125	125	18	10 000	3 340
300	45	M -36	52	50	38	35	122	64	50	20	70	100	22	12 000	4 000
300	45	M -42	55	51	40	38	130	65	50	20	112	108	22	13 000	4 340
300	45	M -42	55	51	40	38	130	65	50	20	112	108	22	13 000	4 340

4.1.2 A typical design of various chains are given in Fig. 1 to 5.

4.2 Slats

4.2.1 The Width, thickness and number of strands of the slats for different milling plant sizes corresponding to different plant capacities shall be as given in Table 5 and 6.

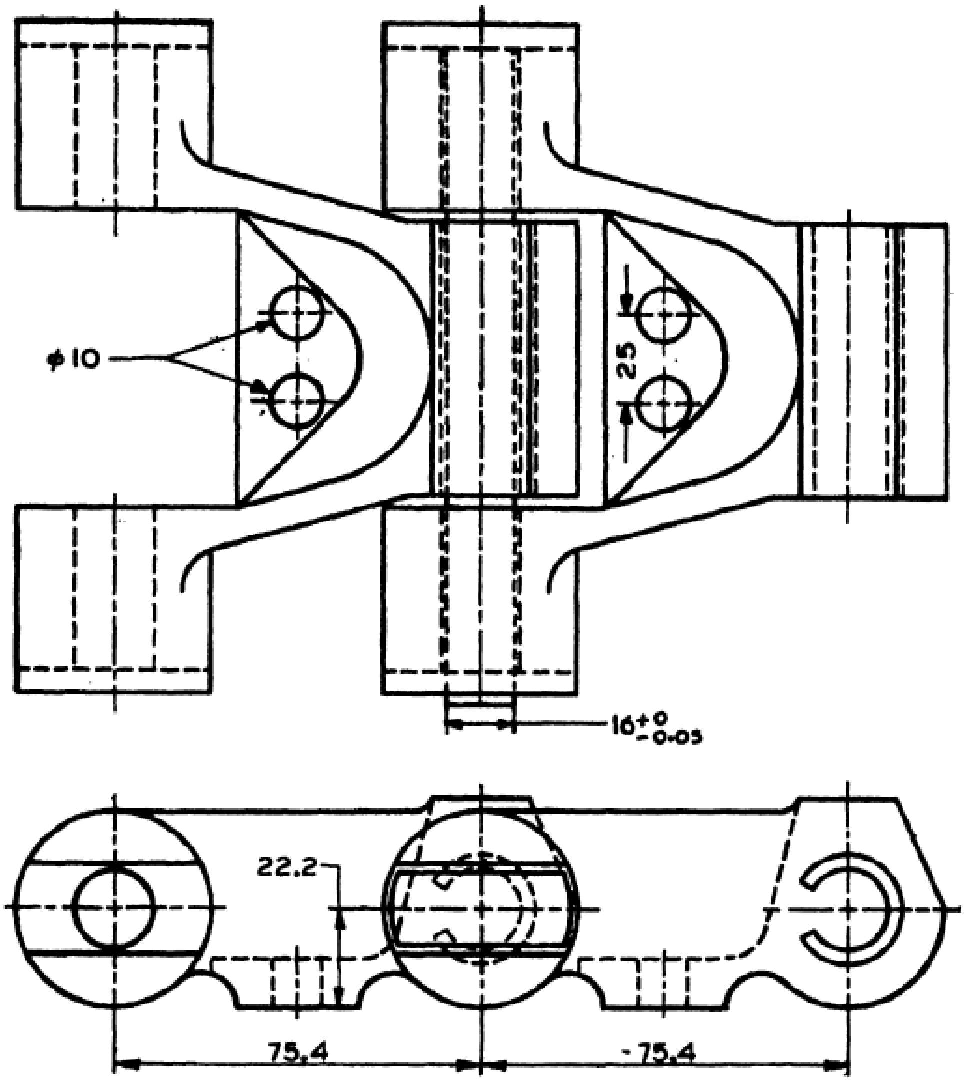


FIG. 1 INTER-CARRIER CHAINS OF 75.4 MM PITCH

Table 6 Dimensions of Apron Type Inter-Carrier Slats for Different Plant Capacities/Sizes

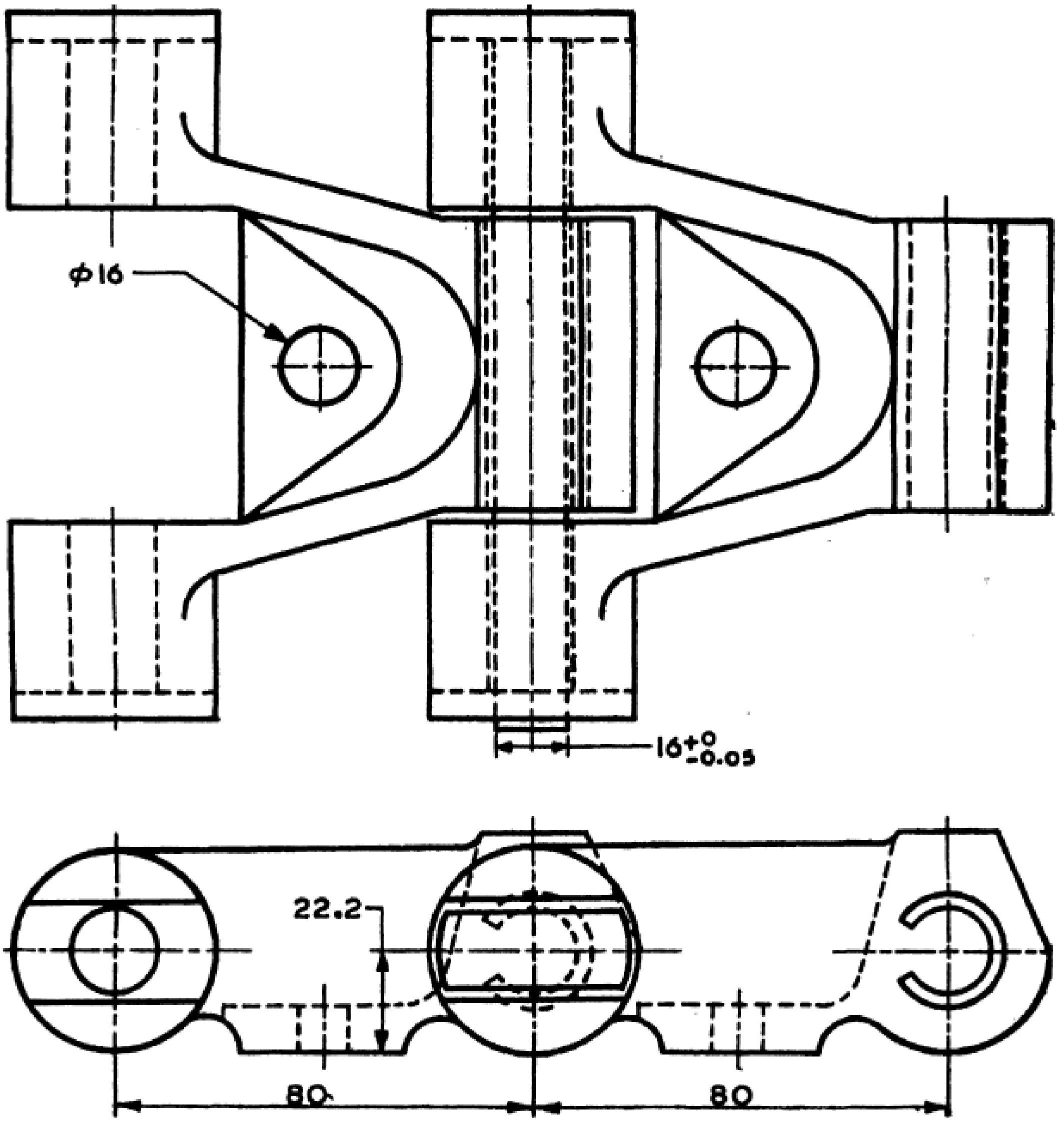
(*Clause* 4.2.1)

Sl. No. (1)	Capacity of Plant in Tonnes/Day (2)	Milling Plant Size (3)	Length of Slats (4)	Width of Slat (5)	Thickness of Slat (6)
i)	1 250 to 2 000	762µ × 1 525 L	1 520	110 + 1	5 + §
ii)	2 500 to 3 500	850 µ × 1 700 L	1 695	110 + 1	5 + §
iii)	4 000 to 5 000	915 µ ×1 830 L or 915 µ × 1 980 L	1 825 or 1 975	115 + 1	5 + §

Table 7 Dimensions of Apron Type Inter-Carrier Slats for Different Plant Capacities/Sizes

(*Clause* 4.2.1)

Sl. No. (1)	Capacity of Plant (Tonnes per Day) (2)	Milling Plant Size (3)	Width of the Slat, W (4)	No. of Strands (5)	Thickness of Slat, l (6)
i)	Up to 2 500	762 × 1 525 L	188 or 183	3	5 ± 0.5
ii)	2 500 to 3 500	850 × 1 700 L	188 or 183	3	6 ± 0.5
iii)	4 000 to 5 000	915 × 1 830 L or 915 × 1 980 L	188 or 183	3	6 ± 0.5
iv)	5 000 to 7 500	1 016 × 2 032	200 or 195	3	8 ± 0.5
v)	7 500 to 10 000	1 143 × 2 286	200 or 195	3	8 ± 0.5
vi)	10 000 to 12 500	1 270 × 2 540	200 or 195	4	8 ± 0.5



All Dimensions in millimetres

FIG. 2 INTER-CARRIER CHAINS OF 80 MM PITCH

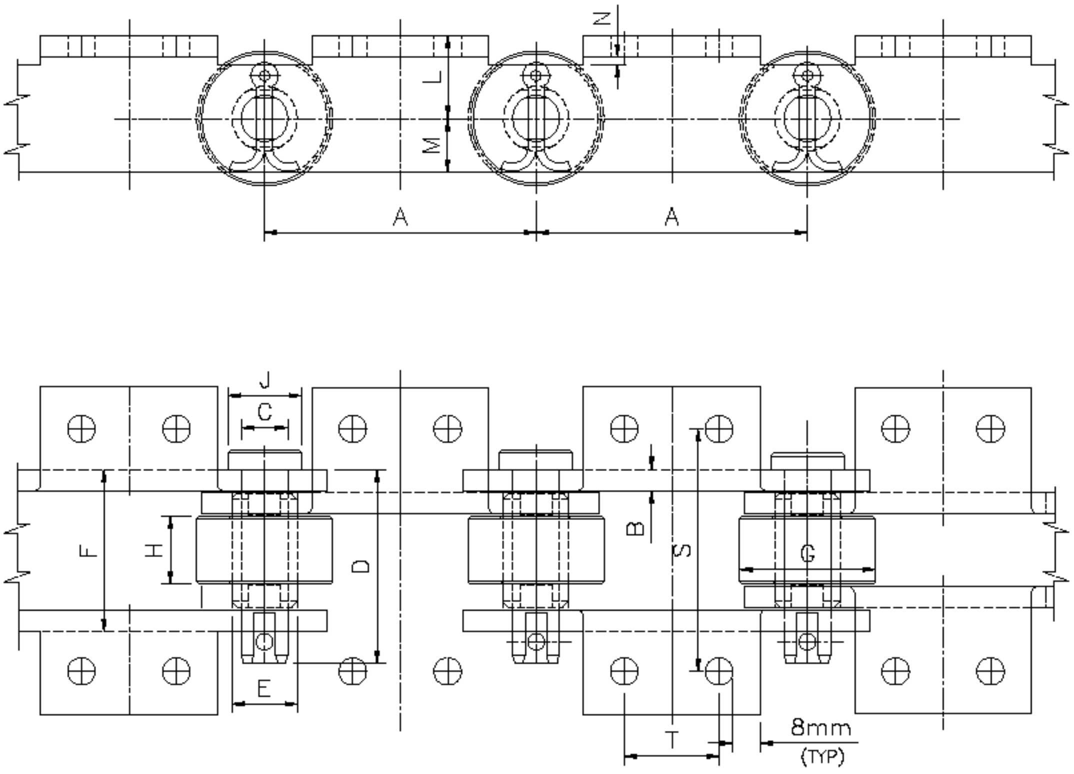


Fig. 3 Typical Design of Cane Carrier Chains

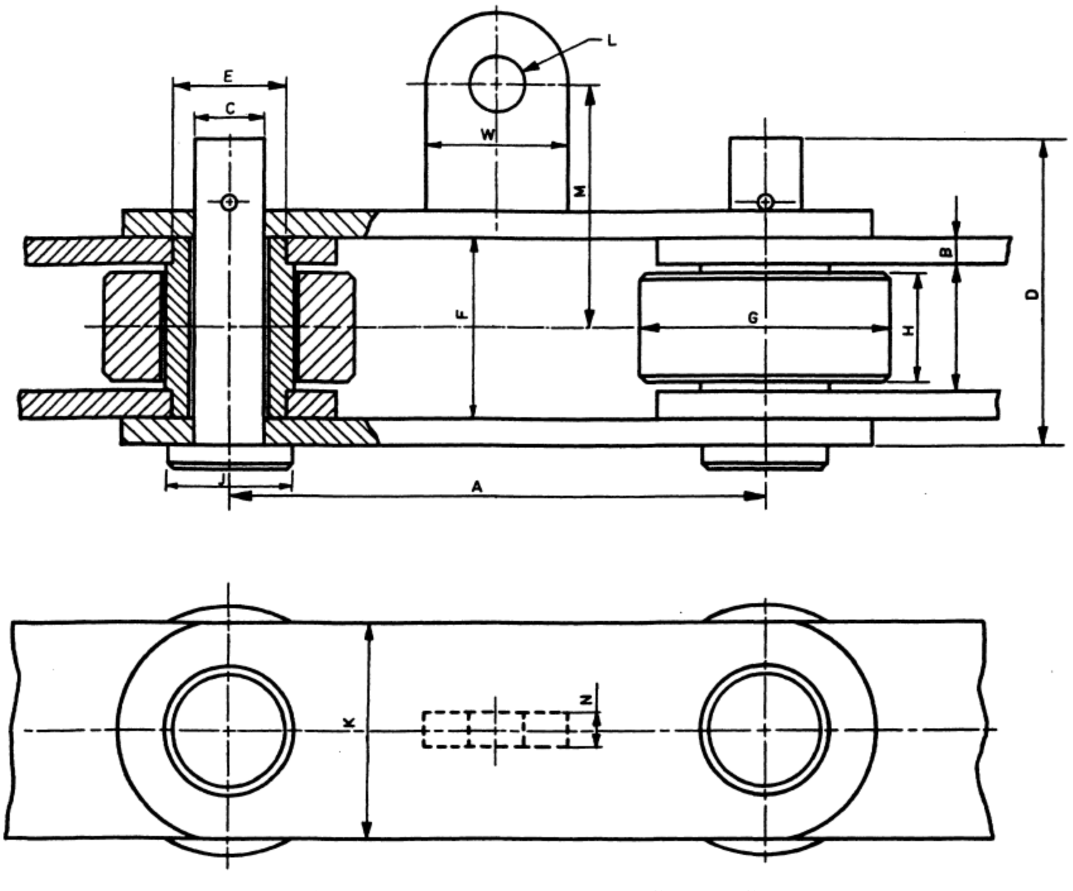
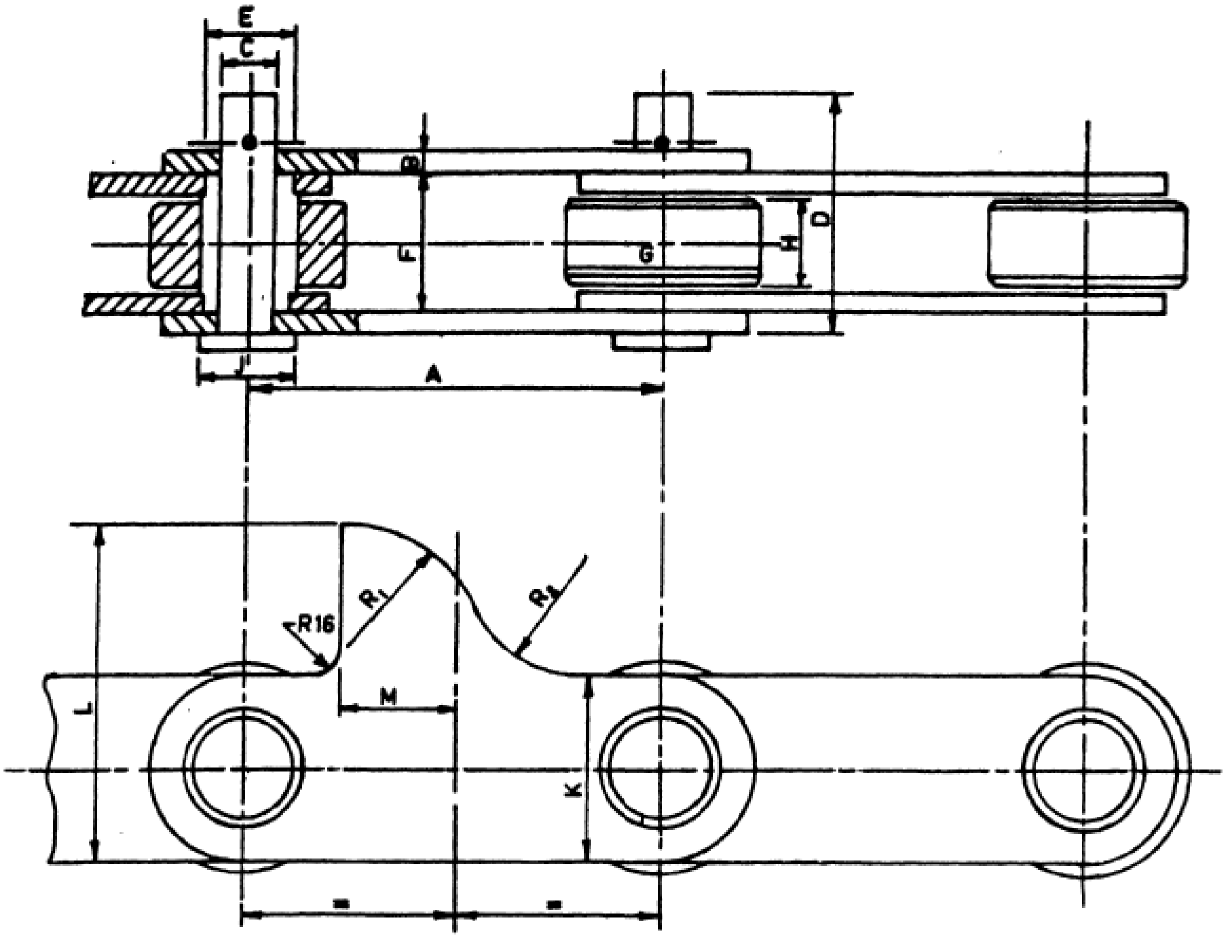


Fig. 4 Typical Design of Baggasse Carrier Chain

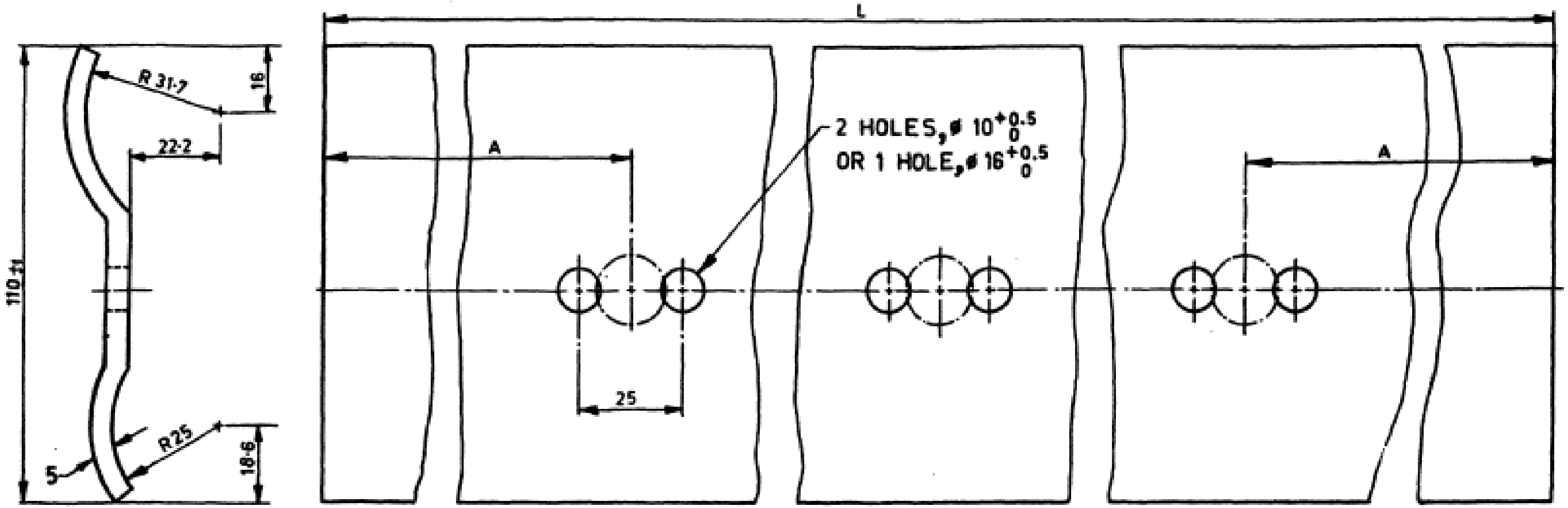


NOTE — Attachment link at every 4th pitch.

FIG. 5 DESIGN OF FEEDER TABLE CHAIN

4.2.2 Typical designs of slats are given in Fig. 6 to 8.

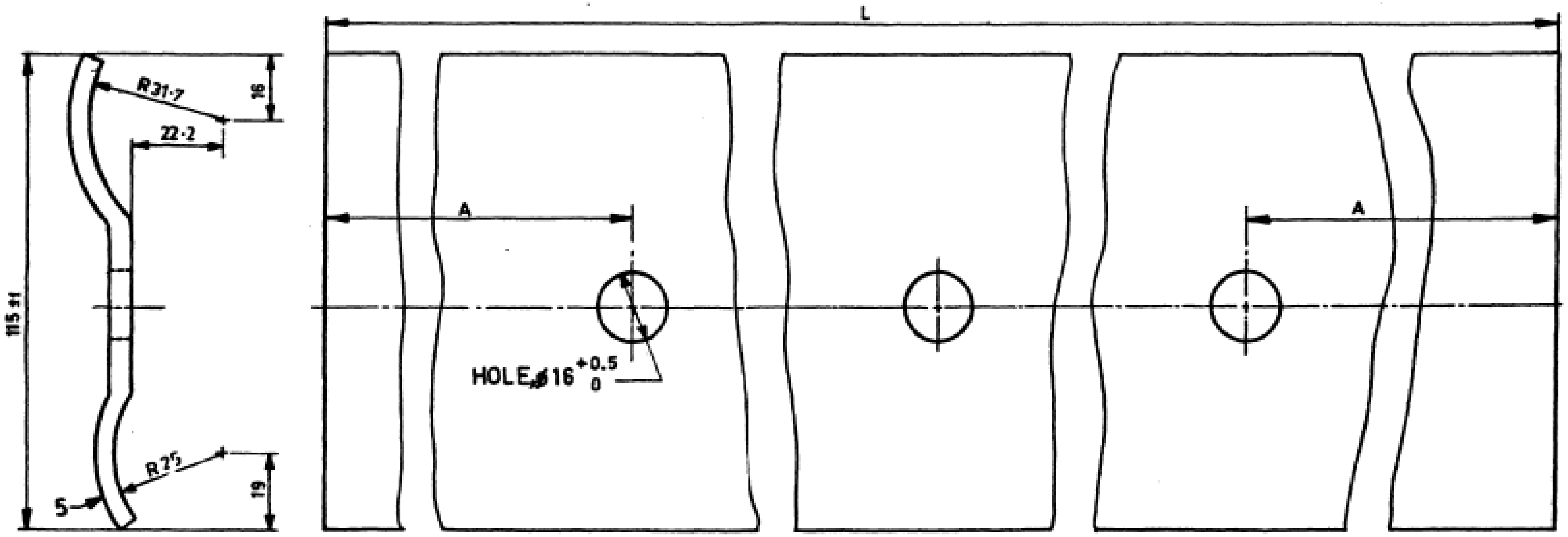
4.2.3 With respect to bagasse carrier chain, either rack or split end corrugated plate may be provided. The plate type slat shall be attached to chain through swivel arrangement as shown in Fig. 9.



Length of Slat (*L*)	1 520	1 795	2 095
Size '*A*'	200	225	250

All Dimensions in millimetres

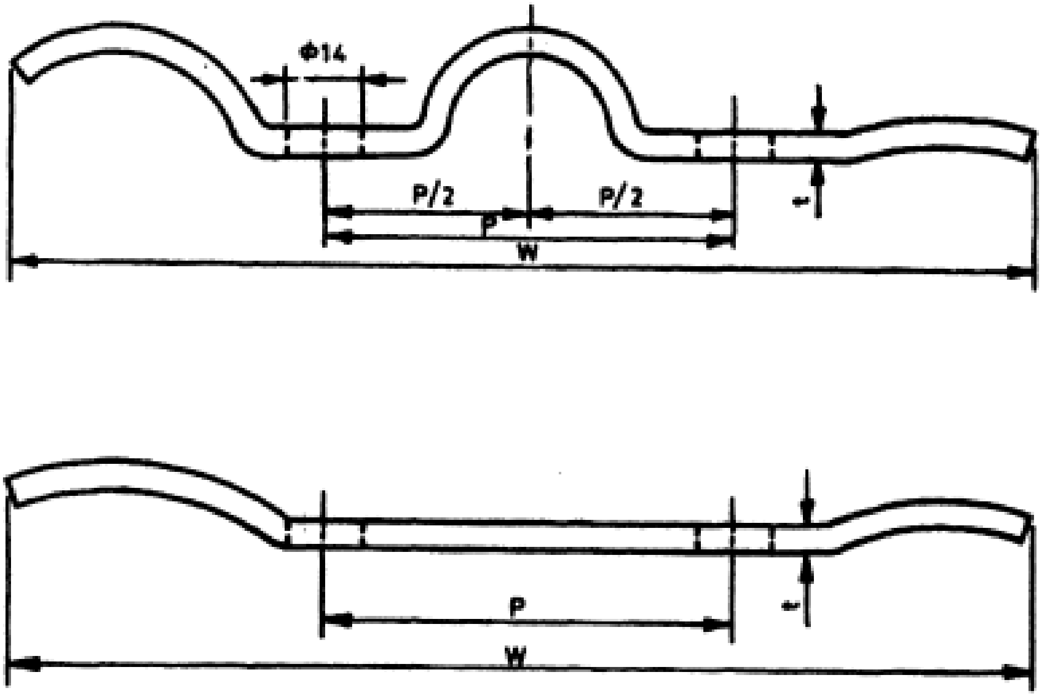
FIG. 6 INTER CARRIER SLAT FOR 75.4 MM PITCH CHAIN HAVING 3 STRANDS



Length of Slat (L)	1 520	1 795	2 095
Size 'A'	200	225	250

All Dimensions in millimetres

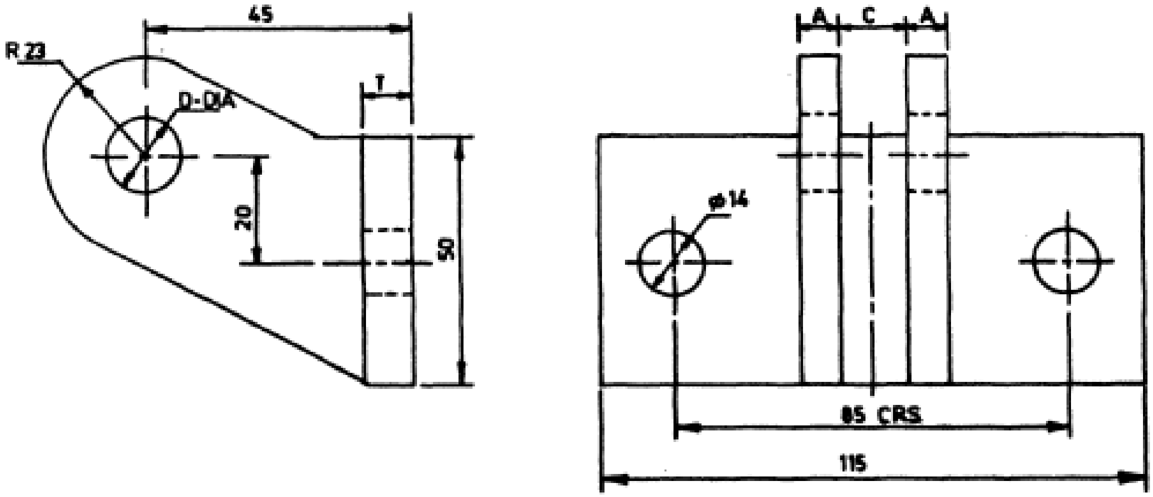
Fig. 7 Inter Carrier Slat for 80 mm Pitch Chain having 3 Strands



P = 60 mm (for hexagonal head bolts)
75 mm (for *T* bolt)

All Dimensions in millimetres

FIG. 8 SLATS FOR CANE-CARRIERS



Pitch	*T*	*A*	*C*	*D*	Breaking Load
150	8	12	13	18	200 kN, *Min*
150	10	12	13	18	300 kN, *Min*
150	12	16	17	20	400 kN, *Min*

MATL - M.S.

All Dimensions in millimetres

FIG. 9 ATTACHMENT LINK FOR BAGASSE CARRIER CHAIN

5 LENGTH ACCURACY

5.1 The finished chain shall be accurate within $^{+0.25}_{-0.0}$ percent of the nominal chain length when measured under the following conditions:

a) Standard test length for measurement — The standard length of chain for measurement purposes shall be 3 000 mm;
b) Support — The chain, in the unlubricated conditions, shall be supported throughout its entire length; and
c) Measuring load — A measuring load equal to 1/50 of the appropriate breaking load shall be applied (*see* Table 1).

NOTE — The length accuracy of chains which have to work in parallel should be within the above limits but matched by agreement with the manufacturer.

6 HARDNESS

The hardness of pin shall be 50 ± 5 HRC and the bush shall be 40 ± 5 HRC. The hardness of the roller shall be 30 ± 5 HRC.

7 OTHER REQUIREMENTS

7.1 All chains shall be subjected to suitable heat treatment. Depth of case hardening should be minimum 0.5 mm. The following conditions shall be observed:

a) The heat treatment shall not produce brittleness in chains; and
b) Heating to a temperature within 50°C above the upper critical point of the steel used, forms part of the heat treatment.

7.2 After heat treatment, the standard length of chain shall be subjected to the breaking load prescribed in Table 1.

7.3 The standard length of chain shall be tested for proof load as prescribed in Table 1.

7.4 Each roller shall be provided with a groove on the bore for holding, grease for lubrication.

7.5 The bagasse carrier chain shall have attachment at 600 mm pitch. Whole shall be tennoned into the link and a sealing weld run shall be provided.

7.6 Side links shall be formed by hot bending and shall be normalized after bending.

7.7 At the option of the purchase reach pin shall be fitted with brass grease nipple. Holes through each pin and bush shall be provided for the grease to travel to inside and outside surfaces of the bush. Each roller shall be provided with a groove on the base of holding grease.

8 SAMPLING FOR LOT ACCEPTANCE

8.1 Chemical Analysis

Chemical analysis of one split pin, one bush, one roller, one side link from each lot shall be carried out according to the relevant Indian Standard. If the analysis does not conform to the requirements specified, a further chemical analysis each of two pins, bushes, rollers, inner side link and outer side links shall be carried out, each of which shall conform to the specified requirements.

8.2 Mechanical Tests

Mechanical tests for breaking load and proof load shall be made on a specimen (*see* **7.2** and **7.3**) from every lot of 300 metres running length. The specimen under test is required to conform to me requirements given in Tables 1 to 4.

NOTE — The term lot applies to all chains of the same pitch and breaking load, heat treated under identical conditions. Each lot shall have running length of not more than 300 m.

9 WORKMANSHIP AND FINISH

9.1 The chain shall be free from pits, bum and other defects which are detrimental in their use.

9.2 Protective coating shall be provided on the surface of the chains.

9.3 The pins and bushes shall have ground finish after heat treatment.

10 DESIGNATION

10.1 The chain shall be designated by the following:

a) Commonly used name,
b) Pitch of the chain,
c) Breaking load and
d) IS number.

11 MARKING

11.1 Each chain shall be marked with the following particulars:

a) Indication of the source of manufacture,
b) Code or batch number,
c) Chain designation, and
d) Slat thickness and length.

11.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

11.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act,* 2016 and the Rules and Regulations made thereunder. The details of the conditions under which the licence for use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

12 SAMPLING

12.1 Lot

In a consignment, all slats of same size manufactured from the same material under similar conditions of production shall be grouped together to constitute a lot.

12.2 Unless otherwise agreed to between the supplier and the purchaser, the procedure given in IS 2500 (Part 1) shall be followed for sampling inspection.

13 PACKING

The chains shall be packed as agreed to between the purchaser and the supplier.

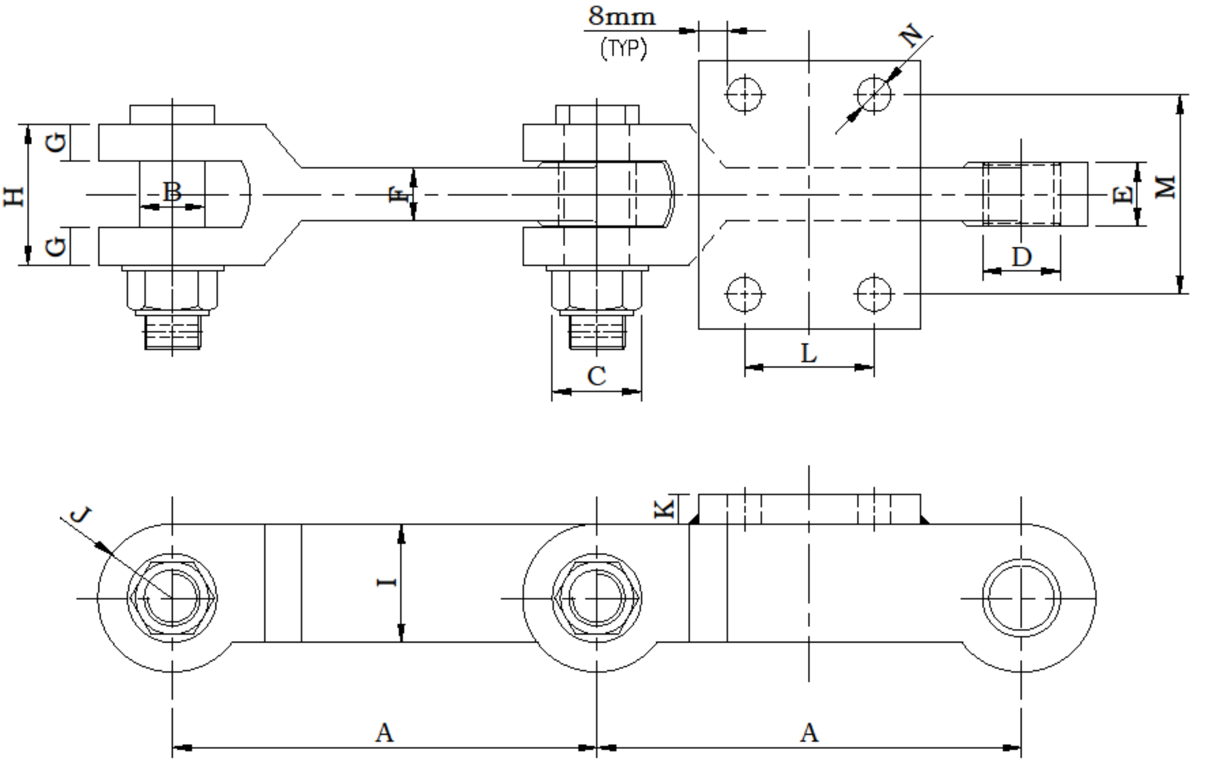


FIG. 10 FORGED CHAIN FOR RAKE ELVATOR / INTER CARRIER

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Sugar Industry Sectional Committee, FAD 02

Organization	*Representative(s)*
National Sugar Insititure, Kanpur	Shri Narendra Mohan (***Chairman***) Shri Ashutosh Bajpai (*Alternate*)
Army Service Core (ASC), New Delhi	Lt Col B. B. Sahu
CONCERT, Chennai	Shri R. Santhanam Shri M. Somasundaram (*Alternate*)
Consumer Guidance Society of India, Mumbai	Shri Sitaram Dixit Dr M. S. Kamat (*Alternate*)
Food Corporation of India, New Delhi	Shri Deepak Kumar Panwar Shri Rakesh Kumar Ranjan (*Alternate*)
Food Safety Standards Authority of India, New Delhi	Ms Apoorva Srivastava (Technical Officer)
Global Cane Sugar Ltd, New Delhi	Dr G. S. C. Rao Mr Anil Srivastava (*Alternate*)
Indian Institute of Sugarcane Research, Lucknow	Dr A. D. Pathak Dr A. K. Sharma (*Alternate*)
Indian Institute of Toxicology Research, Lucknow	Dr Yogeshwer Shukla
Indian Sugar Mills Association , New Delhi	Shri G. K. Thakur Shri Pankaj Rastogi (*Alternate*)
Indian Sugar Exim Corporation, New Delhi	Mr Rajiv Aggarwal Mr Rajeev Kurup (*Alternate*)
Ministry of Consumer Affairs, Food & Public Distribution, New Delhi	Shri Suresh Chandra
National Co-operative Development Corporation, New Delhi	Shri K. P. Vaish Shri N. K. Sharda (*Alternate*)
National Fed. Of Co-operative Development Corporation, New Delhi	Mr Manohar Gopal Joshi
The Sugar Technologists Association of India, New Delhi	Shri Sanjay Awasthi Shri Anurag Goyal (*Alternate*)
Triveni Engineering & Industries Ltd, Muzaffarnagar, UP	Rajesh Singh P. K. Khadelwal (*Alternate*)
BIS Directorate General	Shri P. Rajesh , Scientist 'E' and Head (FAD) [Representing Director General (*Ex-officio*)]

Member Secretary

Shri Rajpal
Scientist 'C', BIS

Panel on Template, FAD 02/Panel (Engineering Standards)

Organization	*Representative(s)*
NSL Sugar, Hydrabad	SHRI T. S. REDDY, CHIEF OPERATING OFFICER (***Convever***)
Chairman, Shrijee Engineering Works, Mumbai	SHRI G. D. AGARWAL
Dalmia Sugars Ltd	SHRI NEERAJ BANSAL
Global Sugar cane Ltd, New Delhi	SHRI MUKESHRI CHOUHAN
Indian Sugar Mills Association, New Delhi	SHRI PANKAJ RASTOGI
JPMA-Pune	SHRI M. S. SUNDRAM
Triveni Engineering & Industries,Khatoli	SHRI ANIL TYAGI
VSI, Pune	SHRI K. R. PATIL

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